

**Safety First and Foremost**

Navigation



The  
Separation  
Safety  
Triad

Communications

Surveillance

**Three Legs of the Safety Stool**

Navigation

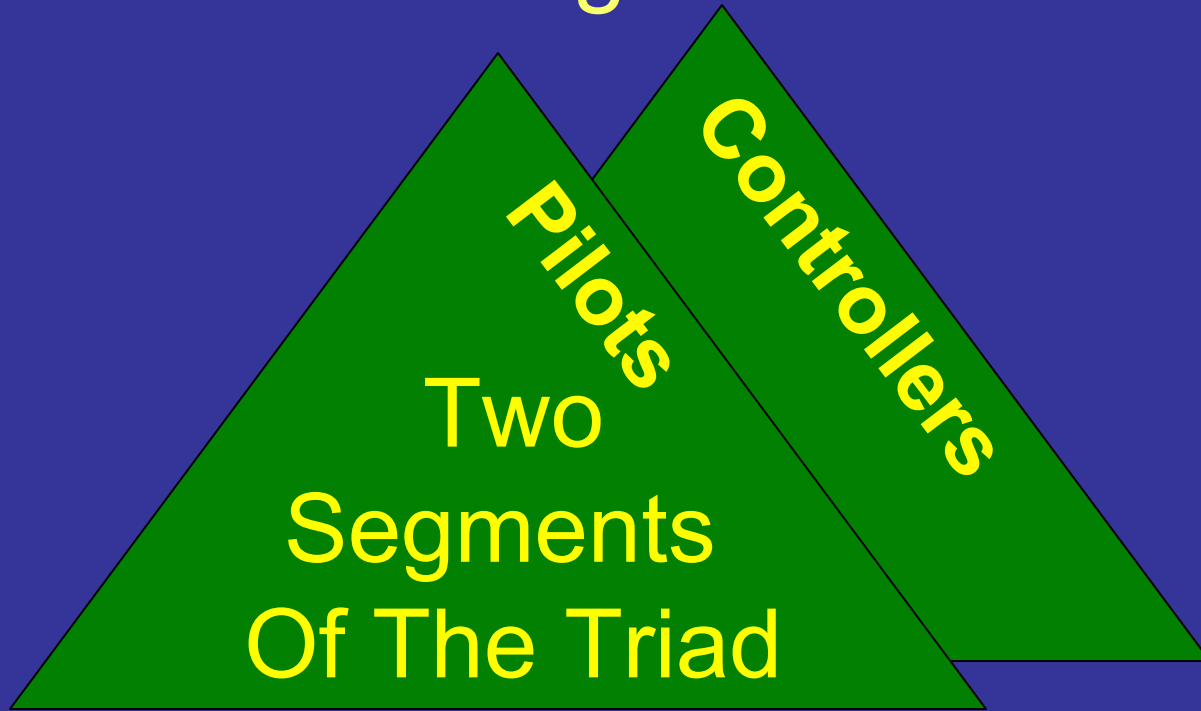
Pilots

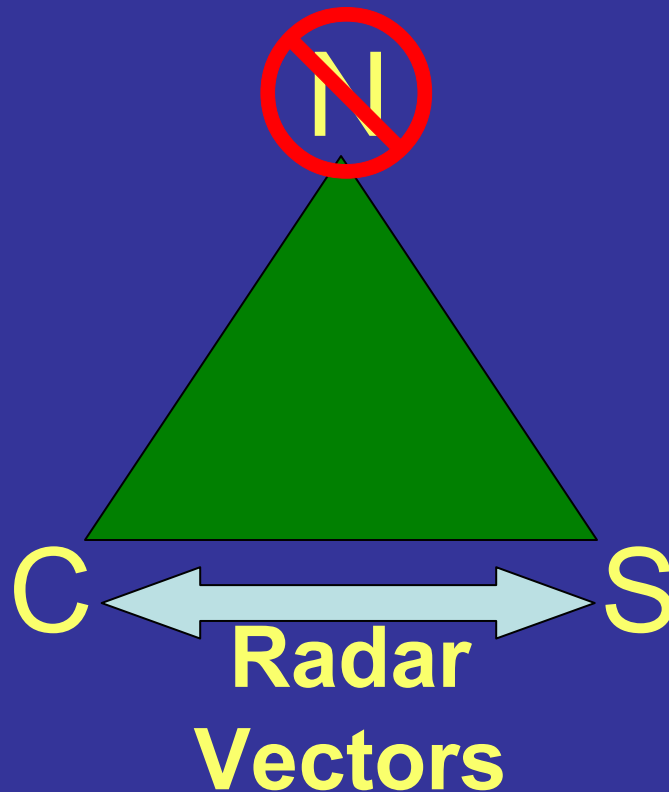
Controllers

Two  
Segments  
Of The Triad

Communications

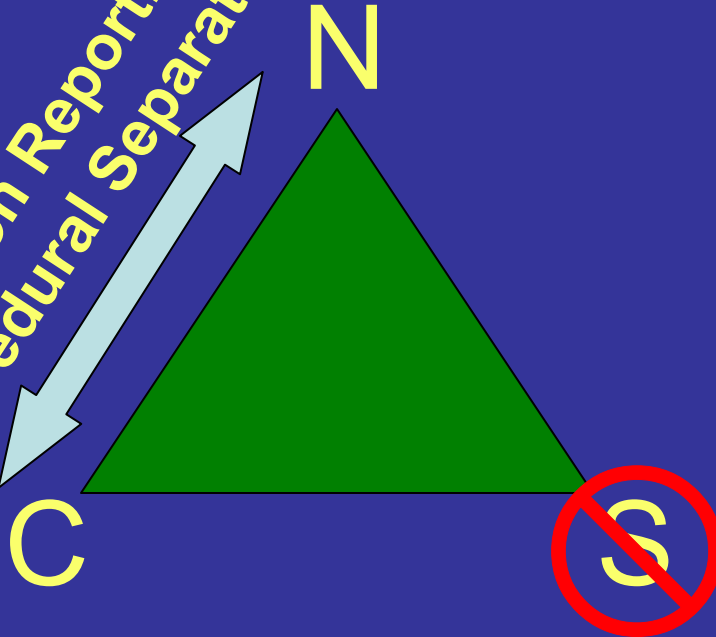
Surveillance





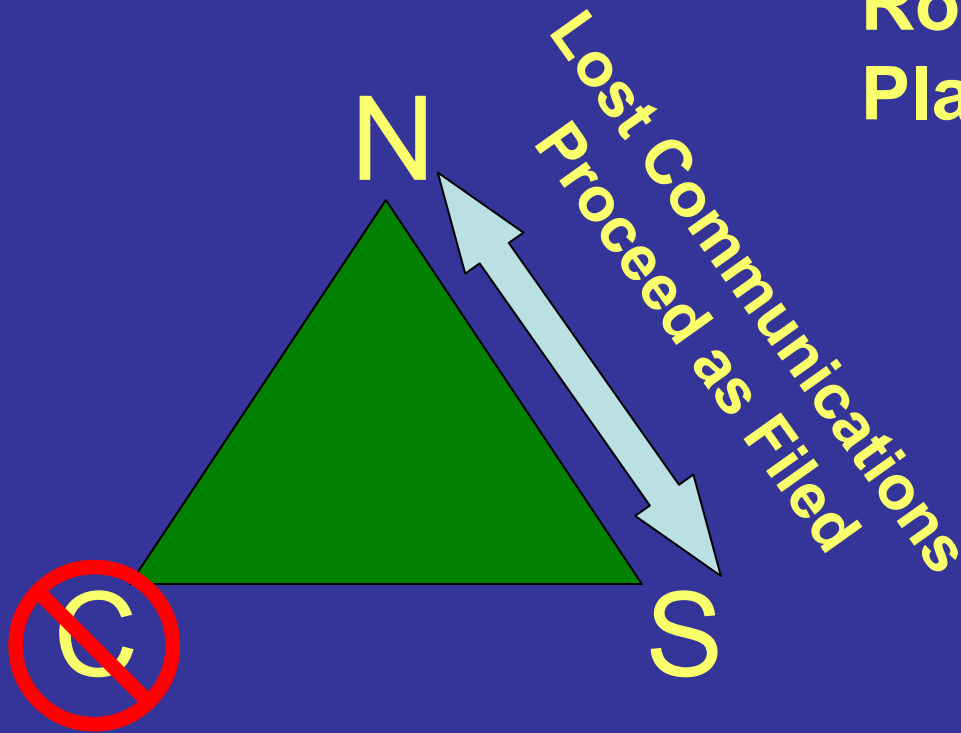
**Get Aircraft to VMC  
for Landing  
Climb Aircraft  
for Coverage  
Radar Vectors to  
Airport in sight**

*Position Reporting*  
*Procedural Separation*



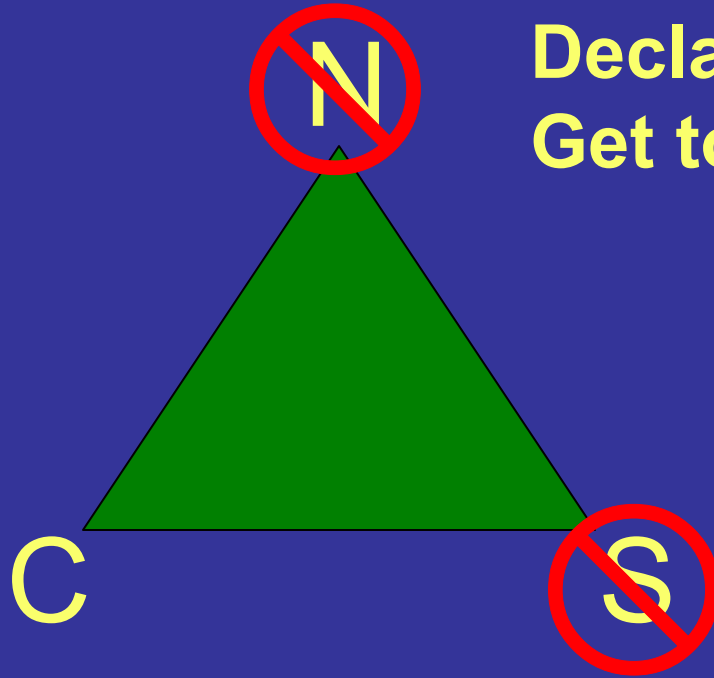
**Use Standard Position  
Reporting**

**Use Lost Communications  
Procedures, Fly Assigned  
Route Based on Flight  
Plan as Amended**



**Controller Clears Out Other  
Traffic and Expects Pilot to  
Follow Last Clearance**

**Use Dead Reckoning  
Declare Emergency  
Get to VFR**



**Controller Clears Out Other  
Traffic and Provides Weather  
and Possible Landing Locations  
Based on Last Known Position**



Controller will Consider You  
as Following Your Flight Plan  
Clears Away Other Traffic  
Tries to Establish Communications  
Projects Route of Flight Through  
Weather Based on Last Position

**How Could This Happen?**

**Consider the following configuration...**

**GPS for Navigation**

**GPS clock for TDMA timing**

**GPS for Automated Dependent Surveillance - A,B,C**

**Aircraft operating in non-radar environment**

**GPS updating the INS**

**Loss of GPS coverage due to constellation problem**

Multimode requires excellent safety analyses

**Failure Modes and Effects**

The more ubiquitous the solution, the more  
crippling the failure

# All the Eggs in One Basket



Smart MMDA Should Be Self-Healing and Soft Fails